

ABSTRACT

The present invention relates to proteinase inhibitor II genes, *SaPIN2a* and *SaPIN2b*, their production in transformed plants, and isolation of SaPIN2a and SaPIN2b proteins from transformed plants of the invention. The invention further relates to use in inhibiting endogenous protease activities in transformed plants. In specific embodiments, the protease activities are trypsin-like and chymotrypsin-like activities. The invention relates to a method for protection of heterologous protein production in transformed plants by the co-expression of a proteinase inhibitor gene, *e.g.* *SaPIN2a* or *SaPIN2b*, which encodes a proteinase inhibitor protein, or a biologically active fragment, analog, and variant thereof, that inhibits protease activities. Specifically, the present invention also provides methods of inhibiting programmed cell death, including senescence, in plants. The invention further relates to methods to enhance resistance of plants to pests or pathogens, including insects. The present invention also relates to genetically modified plants, and in particular genetically modified lettuce. The genetically modified plants have inhibited endogenous trypsin-like and chymotrypsin-like activities following transformation of the plant with a vector comprising one or more proteinase inhibitor II gene, such as *SaPIN2a* and/or *SaPIN2b*. The invention further relates to transformed plants having enhanced resistance to insects. The invention further relates to transformed plants in which PCD or senescence is inhibited by transformation of plants using vectors of the present invention.